The focus of PEO Soldier is to continuously provide improved capability to U.S. forces. The cutting-edge technologies developed for the future XM29 are being used today to develop and field the XM8 and the XM25. The XM29's spiral development strategy could provide the U.S. Army infantryman with a new carbine by FY05 and precision airburst capability by FY07 — systems that will provide enhanced maneuver and fire-support capabilities that will dramatically improve soldier lethality on the battlefield.

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DAVID AHMAD is the Acting Chief of the Future Weapons Division at PM Individual Weapons. He has a B.S. in mechanical engineering and an M.B.A. in management of innovation and technology from Rutgers University. He is currently the system lead on the carbine: 5.56mm, XM8 lightweight weapon system.

FBCB2 Blue Force Tracking — Fielding During Combat

MAJ Rodney A. Mentzer

"FBCB2 is a winner! When all other means of communications failed, FBCB2 carried the day. This system provides improved situational awareness for all soldiers, leaders and staffs. The ability to send and receive text messages, develop and distribute graphics and monitor real-time tactical movements has made the Brigade TOC much more effective."

LTC Richard Trietley, Brigade XO,
1st Brigade, 82nd Airborne Division,
during *Operation Enduring Freedom*,
Khandahar, Afghanistan

On Jan. 7, 2003, a Force XXI Battle Command Brigade and Below (FBCB2) training and installation team arrived in Afghanistan faced with the monumental task of training and equipping the 1st Brigade (Bde.), 82nd Airborne Division's (Abn. Div.) soldiers with a Blue Force Tracking System that would greatly enhance battlefield awareness. These soldiers were in the midst of combat operations and, in many cases, had no prior knowledge of FBCB2 or its tremendous capabilities. The successful fielding can be directly attributed to the 1st Bde.'s outstanding leaders and well-trained soldiers.

Fielding and training a digital situational awareness (SA) command and control (C2) system during combat provided many lessons learned that may apply to other systems fielded during similar conditions. As the Assistant Program Manager (PM) for FBCB2, I provided Blue Force Tracking to the 1st Bde. in Afghanistan.

After receiving the mission to install, train and support this digital system during combat operations from COL Nickolas G. Justice, PM FBCB2, the first thing I did was contact the unit and begin to assemble a mission-capable team. As expected, initial contact with the unit met with some reluctance because the 1st Bde. was scheduled to deploy to a combat zone in less than 2 months. Already training at a high

operations tempo (OPTEMPO), the Brigade was not looking forward to fielding a new system. After scheduling several planning trips to Fort Bragg, NC, the Blue Force Team met with MAJ Armida Montemayor, 82nd Abn. Div. Assistant Division Signal Officer, and LTC Rick Trietley, 1st Bde. XO, to gain support from unit leaders and begin to develop a fielding plan.

A multifunctional, multidisciplined team was assembled to install and train systems in remote locations, under varying weather conditions and during combat operations. The team was comprised of personnel who had individual training experience or had installed FBCB2 systems before. The FBCB2 PM had also chosen several team members that had recently retired from the Army and several people who had prior field service representative (FSR) experience. This proved critical because the FSRs had the necessary technical expertise to operate the system.

> Accommodation of operational requirements and a willingness to work in less then ideal conditions based on vehicle and soldier availability was a major step in gaining warfighter confidence.

The FBCB2 technical and training team first met in November 2002 at Fort Hood, TX. The meeting provided a forum to formulate a mission overview and begin the war-gaming process. Three major issues resulting from the war-gaming process were:

- The need for cross-fertilization among all team members.
- Program of instruction (POI) development to support abbreviated training during combat.
- The criticality of preparation and planning given the prospect of austere logistics support in country.

Early in the planning process, we identified the need to cross-train all team members. We divided the team in half and identified each team member as either an installer or trainer. Those identified as trainers were sent to a 5-day FBCB2 Digital Master Trainers (DMT) Course at Fort Knox, KY. Developed by the FBCB2 U.S. Army Training and Doctrine Command Systems Manager (TSM), this course provided the background and in-depth knowledge of how the system functioned. These school-trained "trainers" became the subject matter experts that would then train the installers.

While the trainers attended the DMT Course, the installers deployed to Fort Bragg for hands-on training to learn how to properly install the FBCB2 system on vehicles once we deployed to Afghanistan. The training provided the installers the critical skills they needed to perform their tasks quickly and efficiently. Additionally, the installers compiled a list of tools and equipment needed to accomplish the task. Each installation kit included an accessory bag of hardware and equipment. When a kit was opened at a remote safe house along the Pakistan border, the team knew they would have the right hardware, tools and equipment to complete the job onsite.

Once all team members had received training in their individual areas of responsibility, we reassembled at Fort Hood to begin the cross-fertilization process. The FBCB2 train-the-trainer scenario saved time and allowed individuals to practice teaching what they had just learned. To ensure the team could effectively train soldiers, the team "borrowed" seven new soldiers from the 1st Cavalry Division to be trained on FBCB2. By training these soldiers and using their subsequent after action review comments, the team further refined the POI that would be used in Afghanistan.

Once everyone was sufficiently familiar with how to install and operate the FBCB2, we began tweaking the POI. We examined both the normal 40-hour POI that is taught at the basic FBCB2 operators course and the modified POI that was used for instruction in the Balkans in the late 1980s. From these two POIs, the team developed a plan that would allow for rapid training during mission down times. The plan simulated *Operation Enduring Freedom* missions and extracted the "need-to-know" from the "nice to know." Once developed, the hybrid POI contained the basics for SA and C2 messaging. To reinforce the training, we created a set of laminated cards that were attached by a D ring to each installed system. The quick-reference cards proved extremely useful in rapidly training soldiers on the system.

During the 10 weeks we were in Afghanistan, the PM FBCB2 installed 144 ground systems, to include 13 tactical operations center (TOC) systems at various echelons

Blue Force Tracking and FBCB2 link satellites, sensors, communications equipment, vehicles, aircraft and weapons in a seamless digital network to provide a continuous, all-weather battlefield picture.

of command. The TOC systems' criticality within the C2 node proved that every echelon within the organization must be fielded a system. Case in point, our initial plan did not include platoon and company command posts (CPs). Without providing CP systems at the platoon and company level, we did not gain the necessary command support for total fielding acceptance and implementation. Notwithstanding, FBCB2 on the nonlinear battlefield has proven incredibly valuable as a C2 node. With the units configured in small fire base positions, each fire base serves as its own unique CP node. Therefore, each fire base must be equipped like its higher TOC for reception and dissemination of plans and graphics. Smaller echelon fielding should be introduced to the G3 when performing mission analysis. Additionally, a complete and thorough understanding of how specific units fight is integral to fielding success and implementation.

> During the 10 weeks we were in Afghanistan, the PM FBCB2 installed 144 ground systems, to include 13 tactical operations center (TOC) systems at various echelons of command.

Systems were installed at seven different locations in Afghanistan. In some cases, these installations were done without power, without cover and in weather conditions that included snow, rain, wind and sand storms. The FBCB2 team knew that moving assets around to remote locations during combat would be extremely challenging. Fortunately, we included the S3 Air in all fielding discussions and subsequent transportation plans and requirements. Because FBCB2 wasn't part of the standard logistics system yet, it was essential that all tools, equipment and spare parts were "kitted" to eliminate any further strain on limited aviation resupply assets.

More than 300 paratroopers were trained on FBCB2 in TOCs, vehicles, safe houses and forward operating bases. Much of this training was conducted on the actual installed platforms. Additionally, the TSM provided excellent handbooks on tactics, techniques and procedures that took users to the next step. The FBCB2 TSM office augmented our team with CPT Thane St. Clair. He joined us a month after deployment as our TOC trainer, traveling between various safe houses training company CPs how to employ the system at their level. St. Clair took our POI to the next level by training users and teaching leaders how to manage and employ the system. In short, his efforts lent credence to the system and reinforced leader support.

Without question, a major test in fielding a new system during combat operations is gaining support and confidence from warfighters and establishing the fielding team's credibility. As Army Acquisition Corps officers fielding new equipment, we were cognizant of the external forces acting upon the unit we were assisting. The approach we took was, the unit is our customer and we must make accommodations to meet the unit's schedule. This is especially important when installing systems on vehicles involved in combat operations and their subsequent OPTEMPO. Accommodation of operational requirements and a willingness to work in less then ideal conditions based on vehicle and soldier availability was a major step in gaining warfighter confidence. Additionally, involving the command team,

ensuring on-the-spot assistance and providing responsive customer service were major elements contributing to the program's success.

Clearly, establishing credibility was paramount to the project's success. The FBCB2 team accomplished this by becoming extremely proficient and efficient at their jobs. Additionally, the entire team was totally committed to mission accomplishment.

In the Nov-Dec 2002 *Army AL&T* magazine, BG Michael Mazzucchi, Program Executive Officer Command, Control and Communications Tactical, stated that we have "made great strides in providing the warfighter valuable tools to understand the tactical situation more clearly, make decisions with more confidence and react more quickly to changing battlefield conditions." The FBCB2 fielding during *Operation Enduring Freedom* was successful because of several key factors: the 1st Bde, 82nd Abn. Div.'s acceptance and support for training and installation of the FBCB2 Blue Force Tracking system; and the civilian team from PM FBCB2 and Northrop Grumman. As the Commander, 2nd Batallion, 1st Bde., 82nd Abn. Div., summarized, "FBCB2 is the best tactical situational awareness tool that I've ever used."

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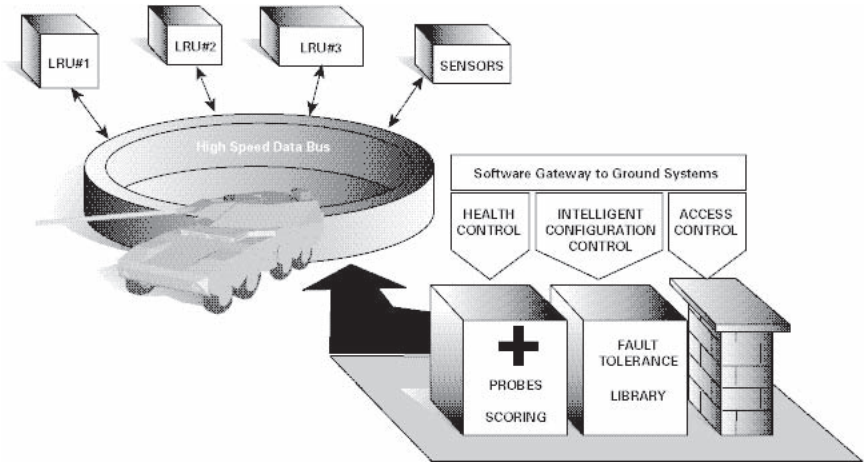
Ground Combat Vehicles: Present and Future Diagnostics and Prognostics

Dr. Elena N. Bankowski and Christopher Miles

The diagnostics capability of ground combat vehicles (GCVs) has to be compatible with the Army Diagnostic Improvement Program. Present systems are capable of performing health monitoring and health checks using internal embedded resources.



They employ standard sensors and data busses that monitor data signals, measurements and built-in tests. These devices provide a comprehensive data source to accomplish complete and accurate system-level diagnostics and fault isolation at line replaceable unit (LRU) level. They provide system health monitoring and prognostics capability for subsystems consisting of engine, transmission, power pack interface, gauge cluster unit and others. Prognostics routines provide diagnostics capability to identify the cause of failure, when failure is predicted, and corrective action to prevent unscheduled maintenance action.

A GCV's health status and prognostic information are displayed to operator, crew and maintenance personnel. Present systems use a common data/information interchange network per standards defined in the Joint Technical Architecture to provide access to vehicle health data. The technologies used in present systems include embedded diagnostics, combat maintainers, revised maintenance concepts and schematic viewers. Implementation